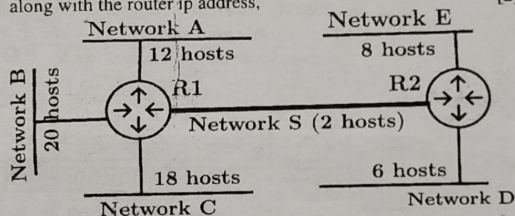


- (c) Modify the static routes you have added at routers R1 and R2 in question-4(b) to default routes. Infer your answer for the two case studies; (i) A PDU is sent out from subnet 3 to Network I (ii) A packet is sent out from subnet 0 to network 5.0.0.0/8. [2]
5. (a) Determine the summary address that would cover all the networks given 192.168.128.0 through 192.168.159.0 and advertise a single efficient route to neighbor router. [2]
- (b) Construct a VLSM network for the IP 192.192.10.0/24 as shown in the below figure. Determine the block size, network address, subnet mask and address range for each network. Assume that n hosts ($n = 2, 6, 8, 12, 18, \& 20$) means it include all valid hosts along with the router ip address. [2]



- (c) Design a LAN using one L2-switch and 4 computers (P1, P2, P3, and P4). Configure each computer with its IP and subnet mask and draw the topology diagram. Now defend your answer with the following situations; [2]
- Status of sending a packet from P1 to P2 (successful/failure)
 - Decide the IP that would be the gateway of P1.
 - Assume that the IP and subnet mask is now changed at P3 to different network. State the status of a packet if it is sent out from P2 to P3.
 - With the same configuration of P3 (different network and mask set). State the status of a packet if forwarded from P1 to P3.

Mid-Semester Examination, April-2023

Computer Networking Workshop (CSE 4541)

Programme: B.Tech.(CSE)
Full marks: 60

Semester: 6th
Time: 2 hours

Subject Learning Outcome	Taxonomy Level	Question Number	Marks
understand Internetworking models, performance of networks, IP addressing mechanisms and Cisco IOS	L3, L4, L5	1a, 1b, 1c	2, 2, 2
	L3, L4, L5	2a, 2b, 2c	2, 2, 2
	L4, L5, L6	3a, 3b, 3c	2, 2, 2
describe, simulate and verify various IP routing technologies	L5, L6, L6	4a, 4b, 4c	2, 2, 2
configure and manage Layer-2 switching, VLANs and inter-VLAN routing	L3, L4, L5	5a, 5b, 5c	2, 2, 2
familiar with different network address translation methods and explore state of the art routing protocols			
dramatize network device management, security, VLAN trunking protocol and spanning tree protocol			
illustrate WAN technologies and enumerate virtual private networks			

* Bloom's taxonomy levels: Knowledge (L1), Comprehension (L2), Application (L3), Analysis (L4), Evaluation (L5), Creation (L6)

Answer all questions. All questions carry equal marks. All bits of each question carry equal marks.

The figures in the right side indicate marks.

- (a) Consider a 100 Mbps link between an earth station (sender) and a satellite (receiver) at an altitude of 2100 km. The signal propagates at a speed of 3×10^8 m/s. Calculate the time taken (in milliseconds, rounded off to two decimal places) for the receiver to completely receive a packet of 1000 bytes transmitted by the sender. [2]
- (b) Consider a source computer (S) transmitting a file of size 10^6 bits

to a destination computer (**D**) over a network of two routers (**R₁** and **R₂**) and three links(**L₁**, **L₂** and **L₃**) as shown in Figure-1. Let each link of length 100km and signals travel over each link at

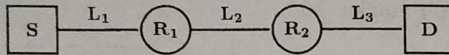
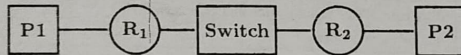


Figure 1: Two nodes interconnected through two routers

a speed of 10^8 meters per second. Assume that bandwidth of the network is 1 Mbps. Let the file broken down into 1000 packets each of size 1000 bits. Evaluate the total sum of transmission and propagation delays in transmitting the file from S to D. [2]

1. (c) Design a cost-effective network topology containing Router(s), Switch(s), Hub(s) and end node-PC(s) such that it will accomplish 3 broadcast domain, 11 collision domains with minimal cost. Consider the cost of each device as: Router - Rs 30, Switch - Rs 20, PC- Rs 15, Hub - Rs 10 and connecting cable - Rs 5. [2]
2. (a) Show the TCP/IP layers and a count of layers are being involved in transmitting a message from a source computer **P1** to a destination computer **P2** for the network given below. [2]

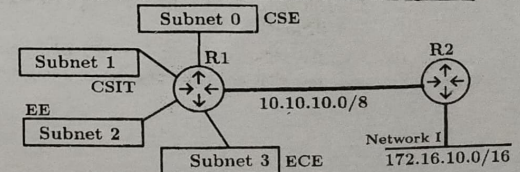


- (b) Determine the operating mode of the ports, either half-duplex or full-duplex, in the given situations: (i) With a connection from a host to a host, (ii) With a connection from a switch to a router, (iii) With a connection from a switch to a hub, (iv) With a connection from a hub to a hub. [2]
- (c) Formulate an IPV4 address distribution scheme of the above network shown in question-2(a) without any error or overlapping of IPs using cisco packet tracer simulator. Additionally criticize the number of networks and IP addresses you have used in that network design. [2]

- (a) Suppose that instead of using 16 bits for the network part of a class B address originally, 20 bits had been used. Calculate the number of class B networks and number of hosts per network would there have been. [2]
- (b) Suppose computers A and B have IP addresses **10.105.1.113** and **10.105.1.91** respectively and they both use the same netmask N. Defend the values of N given below should not be used if A and B should belong to the same network. [2]
- (A) 255.255.255.0 (C) 255.255.255.192
- (B) 255.255.255.128 (D) 255.255.255.224
- (c) Let us consider a routing table is given below. Decide the interface on which the packet will move with the destination address 200.1.2.22 and justify your answer. [2]

Network address	Subnet mask	Interface
200.1.2.0	255.255.255.192	A
200.1.2.64	255.255.255.192	B
200.1.2.128	255.255.255.192	C
200.1.2.192	255.255.255.192	D
0.0.0.0	0.0.0.0	Router ₁

4. (a) SOA University has a class C network 196.20.20.0 and wants to form 4 subnets for the departments CSE, CSIT, EE and ECE. Create the 4 subnets with their subnet address, valid host addresses, broadcast address and subnet mask for each subnet. [2]
- (b) Design the network as shown in the below figure for the subnets constructed in question-4(a) by configuring the IPs for each subnet. Write the IOS commands to configure the router interfaces and formulate the static routes to communicate between the networks. Also state the command to show the routing tables. [2]



MID-SEMESTER EXAMINATION, April-2023 Programming Languages and Compilers (CSE4021)

Programme: B.Tech.

Semester: VI

Full Marks: 30

Time: 2 Hours

Subject/Course Learning Outcome	*Taxonomy Level	Ques. Nos.	Marks
Understand the principles in theory of computation and their role in designing various stages involved in the translation process of a compiler.	L1, L2	1. a)	2
Acquire knowledge in different phases and passes of Compiler, and specifying different types of tokens by lexical analyzer, and able to use the compiler tools like LEX, YACC, etc.,	L1, L2, L3	1. b),c), 2. a),b),c)	10
Understand and design Parser(s) (LL, SLR, CLR and LALR) and its types i.e. Top-down and Bottom-up parsers.	L1, L2, L3	3. a),b),c) 4. a),b),c) 5. a),b),c)	18
Apply and evaluate syntax directed translation schemes, synthesized attributes, inherited attributes, and different techniques for symbol table organization.			
Analyze the generation of various intermediate codes and the process of their optimization.			
Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization.			

*Bloom's taxonomy levels: Knowledge (L1), Comprehension (L2), Application (L3), Analysis (L4), Evaluation (L5), Creation (L6)

Answer all questions. Each question carries equal mark.

1. a) The phases of a typical compiler are *Lexical analysis, Syntax analysis, Semantic analysis & Intermediate code generation, Machine-independent code improvement, target code generation, and machine-specific code improvement* respectively. Define the input(s) and output(s) to each of the phases of the compiler. 2
- b) Explain the terms lexeme, token, and pattern with the help of suitable examples. Find the tokens, from the following C code fragment and state the total number of tokens obtained.
`for (i=1 ; i <=10; i++)` 2

- c) Write the regular definition for **unsigned numbers** and the language '**C**' **identifiers**. The unsigned numbers (integer or floating point) are strings such as 5280, 0.01238, 6.5897E4, or 1.8569E-45 and an identifier in the '**C**' programming language is any string of length 1 or more that contains only letters (**I**), digits (**d**), and underscore(**_**) and begins with a letter or an underscore.

2. a) Suppose we have two tokens: (1) the key word **while** and (2) the keyword **when**. Show the NFA for those two tokens.

- b) Consider the language L given by the regular expression **(a + b)*b (a + b)** over the alphabet {a, b}. Construct the NFA that will accept the language.

- c) Construct the equivalent minimized DFA from the NFA constructed in Q. 2 b) and also find the minimum number of states required for the DFA to accept the language.

3. a) Consider the context-free grammar; 2
 $idlist \rightarrow id\ idlisttail$
 $idlisttail \rightarrow ,\ idlisttail\ |$;

The above productions are normally be used for identifier list in a top-down parser. Show the progressive steps in the top-down construction of a parse tree for the inputted string **id, id, id, id;**

- b) Using the grammar in Q. 3. a) show that bottom-up parser traces out a right-most derivation, in reverse for the string **id, id, id;**

- c) Given the productions for a context-free grammar { $L \rightarrow Ra\ |$ $Qba, R \rightarrow aba\ |$ $caba\ |$ $Rbc, Q \rightarrow bbc\ |$ bc } is not suitable for a top-down predictive parser. Identify the problem and correct it by rewriting the grammar.

4. a) Let G_1 be the following context-free grammar (G is the starting non-terminal);

$G \rightarrow S$
 $S \rightarrow AM$
 $M \rightarrow S\ | \ \epsilon$
 $A \rightarrow aE\ | \ bAA$
 $E \rightarrow aB\ | \ bA\ | \ \epsilon$
 $B \rightarrow bE\ | \ aBB$

Find the FIRST, FOLLOW sets of G_1 .

- b) Explain the algorithm for constructing the non-recursive predictive parsing table?

- c) Analyze the grammar G_1 given in Q.4 a) is LL(1) or not, by constructing the LL(1) parsing table.

5. a) Consider the following grammar: 2

$S \rightarrow (L)\ | \ a$

$L \rightarrow L, S\ | \ S$

Analyze all the handles that can be obtained for the input string **(a , (a , a))**

- b) Construct the canonical set of LR (0) items for the grammar presented in Q. 5 (a). 2

- c) Show the LR(0) parsing table for the grammar in Q. 5 a) and, analyze whether the grammar is LR (0) or not? 2

***** End of Questions *****

MID-SEMESTER EXAMINATION, April-2023
Introduction to Databases (CSE 3151)

Programme: BTech
Full Marks: 30

Semester: 6th
Time: 2 Hours

Subject/Course Learning Outcome	*Taxonomy Level	Ques. Nos.	Marks
To identify and explain the different components and functionalities of DBMS and their interdependence through the database architecture	L2	1 a, b, c, 2 b	8
To analyze an enterprise schema for given user requirements and apply the conceptual database design principles through ER modeling to construct the ER diagram	L4	2 a, c, 3 a, b, c	10
To analyze and design relational database schema using decomposition and normalization techniques	L4	4 a, b, c 5 a, b, c	12

*Bloom's taxonomy levels: Knowledge (L1), Comprehension (L2), Application (L3), Analysis (L4), Evaluation (L5), Creation (L6)

Answer all questions. Each question carries equal mark.

- (a) List four significant differences between a file processing system and a DBMS. 2

(b) What is data model? Differentiate between relational and hierarchical model. 2

(c) Explain the role of different database users. 2
- (a) Distinguish between primary key and partial key with example. 2

- (b) Outline the role of different storage manager components. 2
- (c) Explain the concept of specialization? Compare the different completeness constraints imposed on specialization with proper example. 2
3. (a) Consider a database maintaining the details of the loans and the corresponding installments of a bank. Each loan is represented by a unique loan_no, amount. Each installment is represented by a ino, iamount, idate. The association of loan and installment is represented by the relationship named as loan_inst. One loan may have multiple installments. For each loan the installments are distinguished through ino. The existence of installment is dependent on the loan. Construct the ER diagram for the above database representing entity set, relationship set, mapping cardinality and participation constraints. 2

- (b) Develop the appropriate relational schemas for the database illustrated in the ER diagram related to que. 3(a). 2

- (c) Analyze the referential integrity for the relational schema resulted in que 3(b) and draw its corresponding schema diagram. 2

4. (a) Consider the following set F of functional dependencies on the relation schema $R(A, B, C, D, E, F, G, H)$: 2

$\{ CH \rightarrow G, A \rightarrow BC, B \rightarrow CFH, E \rightarrow A, F \rightarrow EG \}$

List out the all possible candidate keys of R.

(GATE 2013)

- (b) Consider a relational schema $X(P, Q, R, S)$ with the functional dependencies on the relation schema: $F = \{ QR \rightarrow S, R \rightarrow P, S \rightarrow Q \}$. Check the properties of decomposition if R is 2

decomposed into $R1(Q, R, S)$ and $R2(P, R)$.

(GATE 2019)

Consider the following table T and the set of functional dependencies F: $\{ A \rightarrow B, C \rightarrow B, D \rightarrow ABC, AC \rightarrow D \}$ 2

T:	A	B	C	D
	a1	b1	c1	d1
	a1	b1	c2	d2
	a2	b1	c1	d3
	a2	b1	c3	d4

Given the following records or rows, indicate which record can be added in to table T without violating any of the functional dependencies in F. If a record or row cannot be legally added, justify it indicating which functional dependency is violated.

Records: (a2, b1, c4, d8), (a2, b2, c1, d8),
(a3, b1, c4, d3), (a1, b1, c2, d5)

5. (a) What is partial dependency? Identify the number of partial dependencies in a relation $R(A, B, C, D, E)$ with FD set $F = \{ A \rightarrow BE, E \rightarrow C, C \rightarrow AB \}$. 2

- (b) Explain 1NF with proper example. 2

- (c) Consider a relational schema Book (ISBN, Title, Publisher, Address) with the functional dependencies $F = \{ ISBN \rightarrow Title, ISBN \rightarrow Publisher, Publisher \rightarrow Address \}$. Which is the weakest normal form that the schema satisfies? Comment whether it satisfies the property of 2NF or not with reason. If no, redesign the schema satisfying the properties of 2NF. 2

End of Questions

5. (a) Write a python program to compute the mode for the following animal dataset. 2

```
animal=['cat','tiger','dog','cat','lion','dog',
        'cat','dog','cat','cow','cat','tiger','lion']
```

- (b) Given a family with two (unknown) children. If we assume that: 2

- Each child is equally likely to be a boy or girl.
- The gender of the second child is independent of the gender of first child

B: All children are girls

A: The older child is a girl

L: At least one of the child is a girl

Find $P(B|A)$, $P(B|L)$.

Write the python script to compute the conditional probability for the above two cases.

- (c) Write a python function for normal distribution 2
probability density function (PDF) named normal_pdf which takes three parameters: x, mu, and sigma. And plot the graph of this function for different values of mu and sigma.

- mu = 0, sigma = 1
- mu = -1, sigma = 1

End of Questions

MID-SEMESTER EXAMINATION, April-2023

Introduction to Data Science using Python (CSE 3054)

Programme: B.Tech (CSE)

Full Marks: 30

Semester: 6th

Time: 2 Hours

Subject/Course Learning Outcome	*Taxonomy Level	Ques. Nos.	Marks
CO-1: Understand the basics of data science using python.	L2, L3, L4	1(a, b, c), 2(a)	8
CO-2: Understand mathematical and statistical knowledge to interpret and visualize the data.	L2, L3, L4	2(b, c), 3(a, b, c), 4(a, b, c), 5(a, b, c)	22
CO-3: Apply the techniques of extracting and pre-processing the data for solving the complex problems.	L3, L4		

*Bloom's taxonomy levels: Remembering (L1), Understanding (L2), Application (L3), Analysis (L4), Evaluation (L5), Creation (L6)

Answer all questions. Each question carries equal mark.

1. (a) Construct a student network using python code from the following datasets (*students* and *student_pairs*). 2

```
students = [
    { "id": 0, "name": "Rahul" },
    { "id": 1, "name": "Ashok" },
    { "id": 2, "name": "Sarita" },
    { "id": 3, "name": "Piyus" },
    { "id": 4, "name": "Puja" },
    { "id": 5, "name": "Harish" },
    { "id": 6, "name": "Rohan" },
    { "id": 7, "name": "Sunil" },
    { "id": 8, "name": "Rajesh" },
    { "id": 9, "name": "Amlan" },
]
```

```
student_pairs = [(0, 1), (0, 2), (1, 2), (1, 3), (2, 3), (3, 4), (4, 5), (5, 6), (5, 7), (6, 8), (7, 8), (8, 9)]
```

(b) For the dataset given in Q. 1 (a), write the python script to find the number of friends for each student id and sorts them from most number of friends to least number of friends. 2

(c) What is the output of the following Python script? 2

```
from collections import Counter
count = Counter(a=1, b=2, c=3, d=120, e=1, f=219)
for letter, c in count.most_common():
    print( letter, c)
```

if most_common() method is replaced by items() method in the above code then what could be the expected output.

2. (a) What is output of the following python code? 2

```
def display(*args, **kwargs):
    print('Unnamed args:', args)
    print('Keyword args: ', kwargs)

display(1,2,3, key1='soa', key2='iter')
```

Can the positional arguments follow the keyword arguments in the above code?

(b) Generate a list of the 100 random integers between 1 to 100 and write a python program to plot a histogram of the same. 2

(c) Given the following data, 2

```
cars = ['Tata', 'Kia', 'MG',
        'Hyundai', 'Maruti', 'Honda', 'Skoda',
        'Mahindra', 'Renault', 'Toyota']
```

```
production = [2.2, 2.5, 3.6, 5.5, 4.5, 1.2,
              3.3, 8.9, 6.5, 7.6]
```

Write a python program to plot a scatter graph yearly from 2011 to 2020 displaying the title of graph as "Production of Cars" labeling the axes as "Years" and "Production in thousands" labeling the plotted points the names of cars.

3. (a) Write a python program to find the dot product of two vectors using necessary assert condition and concept of Type Annotations. 2

(b) Write a python function to compute the component wise mean of a list of vectors. Assert the condition that the vectors must be of same length. 2

(c) What is the output of the following python program? 2

```
def make_matrix(num_rows, num_cols):
    return [[1 if i==j else 0 for j in
            range(num_cols)]
            for i in range(num_rows)]

print(make_matrix(3,3))
```

Rewrite the above function having three parameters as num_rows, num_cols and an entry_fn. Using this function create a 3x3 matrix which produces the same output as above using lambda function.

4. (a) Compute the Covariance and Correlation between the number of hours watching movies per week and the number of hours sleeping per week for a group of 4 students. 2

The dataset is as follows:

hours_movie= [10,12,14,8]

hours_sleep= [40,48,56,32]

(b) Write the python functions for each statistical measure associated with the problem in Q. 4(a) 2

(c) Analyze the significance of Covariance and Correlation for the dataset given in in Q. 4(a). How does covariance differ from correlation? 2

MID-SEMESTER EXAMINATION, April-2023
Cryptography & Network Security (CSE 3035)

Programme: B.Tech/BCA
Full Marks: 30

Semester: 6th
Time: 2 Hours

Subject/Course Learning Outcome	*Taxonomy Level	Ques. Nos.	Marks
Able to understand the security requirement, different type of security threat and attack and the principles of security design.	L1 L2	1(c) 1(a)(b), 2(a)	8
Able to understand and implement the most common type of cryptographic algorithm.	L1 L2 L3 L4	2(b), 4(c) 5(a) 2(c), 3(a)(b), 4(b) 4(a), 5(b)	18
Able to apply modern algebra and number theory for understanding of cryptographic algorithms and vulnerabilities	L3	3(c), 5(c)	4

*Bloom's taxonomy levels: Remembering (L1), Understanding (L2), Application (L3), Analysis (L4), Evaluation (L5), Creation (L6)

Answer all questions. Each question carries equal mark.

- Briefly explain the significance of CIA triad related to computer security. 2
 - What is meant by "active attack" in the context of cryptographic system. Also name different types of active attacks. 2
 - Differentiate the two terms cryptography and cryptanalysis. 2
- Explain briefly the "chosen plaintext" type attack. 2
 - State the difference between substitution and transposition type encryption techniques with examples. 2

- (c) Formulate caesar cipher for the cipher Text: HHWPDIWHU 2
WKH WRJD SDUWB to identify the plain text with the default key $K=3$.
3. (a) What will be the plain text if the cipher text is given by 2
"SOAUNIVERSITY" using playfair cipher with keyword as
"SECRET" (assuming j is combined with i)? Use 'X' as filler.
- (b) Determine the corresponding ciphertext for the plaintext 2
"hill" using the key matrix
- $$k = \begin{pmatrix} 3 & 2 \\ 8 & 5 \end{pmatrix}$$
- (c) Determine the inverse mod 26 of the matrix $\begin{pmatrix} 2 & 3 \\ 13 & 7 \end{pmatrix}$ 2
4. (a) Consider the Ciphertext "ICUEEPSWSMNLDLIAEOE". Using 2
the Rail Fence Cipher, find out the plaintext for key value 2.
- (b) Using the VIGENERE cipher, encrypt the word "encryption" 2
using the keyword "leg".
- (c) State the advantages and disadvantages of "Steganography". 2
5. (a) Briefly explain the design parameters to realize a Feistel cipher 2
structure.
- (b) Given a 8-bit input $(35)_{16}$ to a permutation table as given 2
below. Find the 8-bit output after permutation (in hexadecimal).
- | | | | |
|---|---|---|---|
| 5 | 1 | 7 | 3 |
| 6 | 2 | 8 | 4 |
- (c) Using Euclidean algorithm find the GCD for the followings: 2
(i) (2740, 1760)
(ii) (4655, 12075)

End of Questions